REMARKS/ARGUMENTS

In the Office Action of May 29, 2009, the Examiner objected to the drawings and specification for different informalities. Examiner rejected claims 1-20 under 35 U.S.C. §101 and §112, second paragraph, and under 35 U.S.C. §102 as anticipated by Brummer et al "Automated Detection of Brain Contours in MRI Data Sets") and under 35 U.S.C. §103 as unpatentable over Brummer in view of Nowinski et al. ("A locus-driven mechanism..."). Claims 8 was found to be allowable if rewritten to overcome §112 rejection.

Claims 1 – 21 were pending in this application. In this response, claims 1 and 21 have been amended to overcome the 35 U.S.C §112 objection. Claims 1 and 21 have been further amended to clarify the subject matter of steps (c) and (d). Support of these amendments can be found in the description page 10 line 27 – page 11 line 26 (which describes the steps of restoring the lost object voxels) and in the description page 9 line 3 (which shows an equation for selecting the intensity threshold by maximizing a function which is a sum of variances of voxel intensities below and above the threshold). In addition, claims 6 and 13 have been cancelled, and claim 7 amended to change the dependency.

No new matter has been added in the new claim set. Thus, claims 1 – 5, 7 – 21 remain pending.

Objection to the Drawings

Figs. 1 – 5 were objected to because they include handwriting. In view of the amendments made to Figs. 1 – 5, Applicant respectfully submits that the rejection of the drawings is now moot and should be withdrawn.

Objection to the Specification

Paragraphs 0002, 0035, 0036 and 0045 of the specification were objected to because they incorporate subject matter into the application by reference to either a publication or a foreign application or patent. Amendments were made to these paragraphs to overcome these objections and Applicant respectfully submits that no new matter has been added. In view of the amendments to the specification, the rejection of the specification is now moot and should be withdrawn.

Rejection to the Claims

Applicant appreciates the time and consideration provided by the Examiner in reviewing this application and allowing claim 8, but traverses the rejection of the claims at least for the following reasons.

Rejection of Claims 1 – 5, 7 – 20 Under 35 U.S.C. §101

Claims 1 – 5, 7 – 20 were rejected under 35 U.S.C. §101 because the claimed invention is allegedly directed to non-statutory subject matter. Applicants respectfully disagree with the Examiner.

According to the principle established by the case Abele 684 F. 2d, when a claim specifies data which clearly represents physical and tangible objects, namely the structures of bones, organs, and other body tissues, the transformation of that raw data into a particular visual depiction of a physical object on a display is sufficient to render that claim patent-eligible. Accordingly, one of Abele's dependent claims was held to be drawn to patent-eligible subject matter as the claim specified that "said data is X-ray attenuation data produced in a two dimensional field by a computed tomography scanner". This principle was upheld in the case Bilski 545 F.3d 943 (page 26 paragraph 1).

Claim 1 defines an MR image of a brain which clearly represents physical and tangible objects, namely the structures of the brain. Therefore, according to the principle established by the case Abele, claim 1, together with its dependent claims 2 – 5, 7 – 20, is patent-eligible. Accordingly, the rejection of the claims under 35 U.S.C. §101 should be withdrawn.

Rejection of Claims 1 – 5, 7 – 21 Under 35 U.S.C. §112

Claims 1 – 5, 7 – 21 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite. In view of the amendments made to claims 1 and 21, Applicant respectfully submits that the rejection under 35 U.S.C. §112 is now moot and should be withdrawn.

Rejection of Claims 1 and 21 Under 35 U.S.C. § 102(b)

Claims 1 and 21 were rejected under 35 U.S.C. §102(b) as allegedly being anticipated by Brummer ("Automatic Detection of Brain Contours in MRI Data Sets," Marijn E. Brummer, et al. IEEE TRANSACTIONS ON MEDICAL IMAGING. VOL 12 NO. 2 JUNE 1993, pages 153 – 166). In view of the amendments to claims 1 and 21, it is respectfully submitted that the rejection under 35 U.S.C. §102(b) is now moot and should be withdrawn.

Amended claims 1 and 21 disclose, *inter alia*:

(i) binarising the plane of the MR image into foreground and background voxels based on at least one threshold selected using anatomical knowledge, the threshold being selected by ***maximizing*** a function which is a sum of ***variances of voxel intensities below and above the threshold***.

(ii) identifying and ***restoring*** object voxels lost during the excluding sub-step of step (c), the restored object voxels being: object voxels located far

from the skull, and lost due to the morphological opening operation(s); object voxels located around the boundaries of the object, and lost due to the morphological opening operation(s); and object voxels lost due to the partial volume effect

Applicants respectfully submit that Brummer does not disclose feature (i). Instead, Brummer discloses obtaining a threshold for separating image objects from the background by ***minimizing*** a function according to Equation (15) which is clearly a sum of the ***frequencies of occurrence of gray values*** in the image since *g(f)* in this equation is a function of *h(f)* and *h(f)* represents a gray-value histogram (See paragraph 1 and Equations (14) and (15) in section B. Background Threshold Determination).

Applicants respectfully submit that Brummer does not disclose feature (ii). Instead, Brummer discloses ***removing*** partial volume voxels from the mask images as these partial volume voxels are non-brain regions (See paragraphs 2 and 6 in section "C. Morphological Operations for Brain Contour Detection) and ***removing*** voxels from the images to restore object contours of the original mask (See paragraph 5 in section "C. Morphological Operations for Brain Contour Detection" and Fig. 12(g) which clearly illustrates a decrease in the number of object voxels after the dilated label image in Fig. 12(f) is masked with the original binary image to restore the object contours of the original mask).

In view of the above, Applicants respectfully submit that both claims 1 and 21 are novel over Brummer.

Non-Obviousness of Claims 1 and 21

Applicant respectfully submits that features (i) and (ii) defined in both claims 1 and 21 are non-obvious in view of the cited documents.

With regard to feature (i), as mentioned above, Brummer does not teach or suggest feature (i). In fact, Brummer teaches away from feature (i) by teaching the step

of ***maximizing*** a ***different function*** to obtain a threshold for separating image objects from the background.

With regard to feature (ii), although Brummer discloses the problems created by partial volume effects and morphological openings, it merely teaches the solution of ***removing*** voxels which were wrongly included in the mask image due to these problems and does not teach or suggest the solution of ***restoring*** voxels which were wrongly omitted from the set of object voxels due to these problems. Hence, a person skilled in the art would not be led to feature (ii) after reading Brummer.

In view of the above, Applicants respectfully submit that claims 1 and 21 are novel and non-obvious over the cited documents and are hence allowable.

Rejection of Claims 2 – 5, 7 and 9 Under 35 U.S.C. § 102(b)

As stated above, claim 1 is believed to be allowable in view of the cited documents. Dependent claims 2 – 5, 7 and 9 are also allowable at least due to their dependency from main claim 1.

Rejection of Claims 10 – 20 Under 35 U.S.C. 103(a)

Claims 10 – 20 were rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Brummer as applied to claim 1 and further in view of Nowinski ("A locus-driven mechanism for rapid and automated atlas assisted analysis of functional images by using the Brain Atlas for Functional Imaging," Wieslaw L. Nowinski, et al., Neurosurg Focus 15(1): Article 3, July 15, 2003, pages 1 – 7 listed in IDS).

As stated above, amended claim 1 is believed to be allowable in view of the cited documents. Dependent claims 10 – 20 are also allowable at least due to their dependency from main claim 1.

Furthermore, claims 15 and 19 define conditions determining the classification of voxels as object voxels whereas claim 18 defines a seeding operation to identify object

voxels. Applicant respectfully disagrees with the Examiner that Brummer teaches the features of these claims. With regard to claims 15 and 19, the "connectivity" section in page 158 and the "Labeling of Connected components" and "Dilation of Label Image" sections in page 159 of Brummer (as quoted by the Examiner) are mere definitions of what these morphological operations are and do not teach or suggest how to classify voxels. With regard to claim 18, section "V Morphological Operations" of Brummer does not even teach or suggest any seeding operation. Therefore, not only are claims 15, 18 and 19 allowable as being dependent on an allowable main claim, the features of claims 15, 18 and 19 further patentably distinguish over the cited documents

Claim 20 defines *inter alia*, "the ***left and right halves*** of the brain are ***treated separately***, and the object voxels used to obtain the location of the I landmark relate to a selected half of the brain, the selected half of the brain having been selected based on a predefined criterion". Applicant respectfully disagrees with the Examiner that Brummer discloses this feature. In the last paragraph of the left column in page 157 (as quoted by the Examiner), Brummer discloses that the brain is known to be located predominantly in the superior portion of the head and the extent of what is the ***superior half*** of the head can be estimated whereas the remainder of the head mask can be ***discarded***. A person skilled in the art would understand that the motivation behind treating the left and right halves of the brain separately and using only the superior half of the head for further processing is very different and hence would not be led to implement the features of claim 20 after reading Brummer. Therefore, not only is claim 20 is believed to be allowable as being dependent on an allowable main claim, the features of claim 20 further patentably distinguish over the cited documents.

CONCLUSION

In light of the present amendments and remarks, Applicant respectfully submits that the present claims are in condition for allowance.

The Commissioner is hereby authorized to charge any additional fees which may be required in this application under 37 C.F.R. §§ 1.16-1.17 during its entire pendency, or credit any overpayment, to Deposit Account No. 06-1135.

Respectfully submitted,

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APPENDIX

1. REPLACEMENT SHEETS 1/5-5/5